

ritory have been much swollen during the month. At the close of the month the lowlands in the southern part of this city were flooded. At Ogden several dams were swept away, entailing losses estimated at \$6,000. Numerous washouts occurred on the Union Pacific railroad. The Denver and Rio Grande railroad in southeastern Utah was flooded and no trains from Denver arrived after the 28th. The water in Great Salt Lake reached a greater height than has been known for many years.

Nephi, Juab county: the railroad bridge at the forks of Salt creek was washed away on the 9th.

West Virginia.—Wheeling: on the 13th the southeastern part of Jackson county, in this state, was visited by a severe storm which caused heavy losses to the farmers along the creek bottoms. Several dwellings and bridges and numerous barns are reported to have been washed away. The orchards and newly planted fields were also seriously damaged.

#### RAIN FROM A CLOUDLESS SKY.

Key West, Florida: from 9.45 to 10 p. m. of the 28th, a light rain fell when no cloud was visible except near the western horizon.

#### HIGH TIDES.

Eastport, Maine: 11th and 27th.

#### VERIFICATIONS.

##### INDICATIONS.

The detailed comparison of the tri-daily indications for May, 1884, with the telegraphic reports of the preceding twenty-four hours, shows the general average percentage of verifications to be 81.54 per cent. The percentages for the four elements are: Weather, 87.43; direction of the wind, 75.81; temperature, 79.52; barometer, 86.22 per cent. By geographical districts, they are: For New England, 79.66; middle Atlantic states, 84.35; south Atlantic states, 84.25; eastern Gulf, 83.93; western Gulf, 84.90; lower lakes, 79.92; upper lakes, 78.04; Ohio valley and Tennessee, 81.80; upper Mississippi valley, 78.35; Missouri valley, 78.65; north Pacific, 86.29; middle Pacific, 87.10; south Pacific, 89.52. There were three omissions to predict out of 3,137, or 0.09 per cent. Of the 3,134 predictions that have been made, seventy-eight, or 2.49 per cent., are considered to have entirely failed; one hundred and fifty-two, or 4.85 per cent., were one-fourth verified; four hundred and thirty-six, or 13.91 per cent., were one-half verified; six hundred and seventy-four, or 21.51 per cent., were three-fourths verified; 1,794, or 57.24 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

#### CAUTIONARY SIGNALS.

During May, 1884, two hundred and sixty-six cautionary signals were ordered. Of these, one hundred and ninety-seven, or 74.06 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. Fifty-eight cautionary off-shore signals were ordered, of which number forty-six, or 79.31 per cent., were fully justified, both as to direction and velocity; forty-eight, or 82.76 per cent., were justified as to velocity; and forty-nine, or 84.48 per cent., were justified as to direction. Three hundred and twenty-four signals of all kinds were ordered, two hundred and forty-three, or 75.0 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Of the above cautionary off-shore signals, fifty-four were changed from cautionary; no northwest signals were ordered. Five signals were ordered late. In eighty-seven cases winds of twenty-five miles or more per hour were reported for which no signals were ordered.

Prof. T. C. Mendenhall, director of the "Ohio Meteorological Bureau," in his report for May, 1884, makes the following statement:

In the matter of railway weather signals the percentage of verification for the month is: for temperature, 93; and for state of the weather, 78, the mean being 85.5. For May of last year the percentage of verification was reported as 75, and a gain of more than 10 per cent. is shown.

Arrangements are now nearly completed for placing the system of car signals upon the two divisions of the Hocking Valley and Columbus and Toledo Railway. It is expected to have the system in successful operation before the end of June, and efforts will be continued to secure permission to place the signals on the cars of other lines of railway.

#### TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors during May, 1884, with the average depth at which the observations were made and the mean temperature of the air at the various stations, are given in the table below. The highest water temperatures, 86° 5 and 81° 3 were reported from Key West, Florida, and Savannah Georgia, and occurred on the 21st and 25th respectively, the lowest, 32° 9 occurred at Buffalo, New York, on the 2d. The smallest monthly range, 2° 9 occurred at Eastport, Maine; the greatest, 24° 1, occurred at Buffalo, New York. Observations were interrupted by ice at Duluth, Minnesota from the 1st to 11th, and at Marquette, Michigan on the 5th. On account of breakage of instruments no observations were made at San Francisco, California and Fort Canby, Washington Territory, from the 1st to 15th.

Temperature of water for May, 1884.

Station.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey.....	66.0	49.5	16.5	ft. 5	58.7
Alpena, Michigan.....	61.5	41.5	20.0	12	48.5
Augusta, Georgia.....	80.5	60.0	20.5	7	74.0
Baltimore, Maryland.....	68.5	57.4	11.1	9	64.8
Block Island, Rhode Island.....	56.0	44.9	11.1	8	55.0
Boston, Massachusetts.....	55.4	46.1	9.3	21	53.8
Buffalo, New York.....	57.0	32.9	24.1	10	52.1
Canby, Fort, Washington*.....	66.9	48.5	18.4	15	53.4
Cedar Keys, Florida.....	86.5	76.5	10.0	8	77.0
Charleston, South Carolina.....	80.2	68.7	11.5	42	74.8
Chicago, Illinois.....	55.8	46.3	9.5	8	56.7
Chincoteague, Virginia.....	76.9	56.7	20.2	4	61.7
Cleveland, Ohio.....	58.8	45.5	13.3	14	57.7
Detroit, Michigan.....	60.4	48.2	12.2	23	58.9
Delaware Breakwater, Delaware.....	67.0	48.7	18.3	9	60.0
Duluth, Minnesota.....	41.2	38.5	2.7	4	48.9
Eastport, Maine.....	40.2	37.3	2.9	15	46.5
Escauaba, Michigan.....	55.1	34.9	20.2	17	49.1
Galveston, Texas.....	82.0	71.4	10.6	12	75.9
Grand Haven, Michigan.....	66.2	57.0	9.2	19	55.1
Indianola, Texas.....	82.0	66.9	15.1	9	75.4
Jacksonville, Florida.....	84.9	75.4	9.5	18	76.5
Key West, Florida.....	87.7	79.2	8.5	17	80.9
Mackinaw City, Michigan.....	51.8	37.0	14.8	10	47.7
Macon, Fort, North Carolina.....	77.0	62.5	14.5	6	64.3
Marquette, Michigan.....	38.0	34.7	3.3	9	47.2
Milwaukee, Wisconsin.....	52.1	45.1	7.0	8	53.5
Mobile, Alabama.....	81.5	68.5	13.0	16	74.6
New Haven, Connecticut.....	62.2	49.2	13.0	15	55.9
New London, Connecticut.....	55.0	44.0	11.0	12	55.8
New York City.....	60.9	50.5	9.5	16	58.8
Norfolk, Virginia.....	75.4	61.6	13.8	16	68.1
Pensacola, Florida.....	77.3	71.1	6.2	17	74.2
Portland, Maine.....	50.9	42.5	8.4	16	53.9
Portland, Oregon.....	61.7	51.0	10.7	62	59.8
Sandusky, Ohio.....	65.0	54.0	11.0	11	59.6
Sandy Hook, New Jersey.....	56.8	47.3	9.5	1	58.9
San Francisco, California*.....	59.7	50.2	3.5	39	58.2
Savannah, Georgia.....	81.3	65.7	15.6	10	76.1
Smithville, North Carolina.....	78.0	66.8	11.2	11	71.5
Toledo, Ohio.....	69.2	56.2	13.0	12	59.8
Wilmington, North Carolina.....	77.6	62.8	14.8	19	71.5

\* Reports incomplete; see text.

#### ATMOSPHERIC ELECTRICITY.

##### AUORAS.

The only auroral display of the month, observed at more than one place, was that which occurred during the early morning of the 1st; and it was only observed at a few of the more northerly stations between New Hampshire and Dakota, as will be seen from the following reports:

Mount Washington, New Hampshire: a faint auroral display was observed from 1.30 a. m. of the 1st until daylight; it consisted of indistinct streamers extending upward 50°; no arch was visible.

Boston, Massachusetts: from 2 a. m. until daylight of the 1st, was observed a very brilliant auroral display in the form of an arch with streamers of light red color. The arch extended over about 40° of the northern sky and to an altitude of 45°.

During the day there was a peculiar arrangement of clouds, indicating the continuance of the aurora; at dusk the auroral light was again visible and continued until 11 p. m., but it was much less brilliant than the display of the early morning.

Wauseon, Ohio: a moderately bright aurora, consisting of streamers reaching an altitude of 30°, was observed from 12.30 to 2 a. m. of the 1st.

Bismarck, Dakota: aurora observed from 1.26 a. m. until daylight on the 1st. No beams were visible.

The other displays are as follows:

Fort Macon, North Carolina: a faint auroral display was observed from 11.30 to 11.50 p. m. of the 15th; it appeared above a bank of dark clouds and extended about 45° above the horizon. The telegraph lines were slightly affected by the display.

Fremont, Nebraska: dim aurora on the 7th.

Vevay, Indiana, 28th: faint aurora at 8 p. m.

Voluntary observers at Logansport, Indiana, and Embarras, Wisconsin, report auroral displays, on the 8th and 22d, respectively, but the hour at which they were seen and the peculiarities of the displays were not given.

#### THUNDER-STORMS.

Thunder-storms are reported to have occurred in the various districts on the following dates:

*New England.*—2d, 3d, 5th, 6th, 8th to 11th, 14th to 17th, 19th, 20th, 22d to 25th, 27th.

*Middle Atlantic states.*—1st, 2d, 4th to 10th, 12th to 15th, 17th to 21st, 23d to 28th.

*South Atlantic states.*—2d, 3d, 5th to 9th, 11th to 16th, 18th, 19th, 20th, 22d to 29th.

*Florida peninsula.*—5th, 6th, 8th, 10th, 14th to 23d, 25th to 28th.

*Eastern Gulf states.*—2d, 4th, 5th, 8th, 14th, 16th to 27th, 29th.

*Western Gulf states.*—1st to 5th, 7th, 12th to 22d, 24th, 26th, 27th, 29th, 30th, 31st.

*Rio Grande valley.*—2d to 7th, 13th to 17th, 19th to 23d, 25th to 28th.

*Tennessee.*—2d to 6th, 10th to 14th, 19th, 21st to 27th.

*Ohio valley.*—1st, 3d to 7th, 9th to 13th, 15th, 18th, 19th, 22d, 23d, 26th, 27th, 28th.

*Lower lake region.*—1st to 6th, 9th, 10th, 11th, 13th, 15th, 16th, 18th, 19th, 22d, 23d, 26th, 27th.

*Upper lake region.*—1st, 4th to 13th, 15th, 18th, 22d to 26th.

*Extreme northwest.*—4th, 9th, 10th, 17th, 21st, 27th, 30th.

*Upper Mississippi valley.*—1st, 2d, 4th to 13th, 17th to 23d, 25th, 31st.

*Missouri valley.*—1st to 5th, 9th, 11th, 12th, 13th, 15th to 27th, 29th, 30th, 31st.

*Northern slope.*—4th, 6th, 10th, 11th, 12th, 15th, 16th, 18th, 19th, 20th, 23d, 25th to 30th.

*Middle slope.*—1st, 4th, 10th to 17th, 19th to 31st.

*Southern slope.*—1st, 2d, 6th, 7th, 12th, 14th to 21st, 24th to 28th, 30th.

*Southern plateau.*—1st, 2d, 15th, 17th to 21st, 25th, 26th, 27th, 29th, 30th, 31st.

*Middle plateau.*—3d, 8th to 11th, 13th, 14th, 15th, 17th, 19th, 20th, 21st, 23d to 26th, 29th.

*Northern plateau.*—8th, 9th, 13th, 14th, 15th, 24th, 25th, 31st.

*North Pacific coast region.*—3d, 8th to 11th, 13th, 24th, 25th.

*Middle Pacific coast region.*—8th, 10th, 16th to 19th, 30th, 31st.

*South Pacific coast region.*—San Diego, California, 14th, 17th; Cahuenga, California, 15th, 17th.

The following are some of the most important instances of damage by lightning which have occurred during the month.

Dover, Strafford county, New Hampshire: during a violent thunder-storm on the morning of the 9th, several buildings were struck by lightning and burned, entailing a total loss of \$21,000. Numerous instances of damage by lightning were

also reported from various points in New England on the above date.

Fort Worth, Texas: at 2 a. m. of the 21st the cupola on the telephone exchange building was struck by lightning. One hundred and fifty wires connected with the switchboard were melted and the switchboard was ruined.

Philadelphia, Pennsylvania: on the night of the 23-24th, a large oil tank at the Atlantic refinery in the southwestern part of the city was struck by lightning and set on fire. The flames spread rapidly to the other tanks in that vicinity and on the morning of the 24th thirty tanks of oil were burning. The losses resulting from this conflagration are estimated at \$280,000.

Cleveland, Ohio: during a violent thunder-storm on the night of the 23-24th, two tanks of petroleum were struck by lightning and set on fire; loss, \$30,000.

Brownsville, Texas: considerable damage was done to the telephone exchange by lightning on the 27th.

#### ATMOSPHERIC ELECTRICITY INTERRUPTING TELEGRAPHIC COMMUNICATION.

Rio Grande City, Texas, 2d.

Ashland, Oregon, 11th.

Fort Macon, North Carolina, 14th, 26th.

Fort Assinaboine, Montana, 16th, 26th, 27th.

#### OPTICAL PHENOMENA.

##### SOLAR HALOS.

Solar halos were observed in the various districts on the following dates:

*New England.*—4th, 6th, 7th, 19th, 21st, 22d, 26th, 27th.

*Middle Atlantic states.*—2d to 5th, 10th, 13th, 15th, 16th, 19th, 24th, 25th.

*South Atlantic states.*—3d, 4th, 5th, 7th, 8th, 15th, 18th, 21st, 22d, 27th, 28th, 29th, 31st.

*Florida peninsula.*—18th, 29th.

*Eastern Gulf states.*—1st, 3d, 4th, 14th, 15th, 20th, 22d, 25th.

*Western Gulf states.*—2d, 6th, 12th, 14th, 16th, 17th, 19th, 20th, 21st, 23d, 25th, 26th, 28th, 30th, 31st.

*Tennessee.*—1st, 2d, 4th, 14th, 15th, 20th, 22d, 23d, 24th, 26th, 29th, 30th.

*Ohio valley.*—1st, 5th, 17th, 18th, 20th.

*Lower lake region.*—2d, 5th, 10th, 11th, 14th to 17th, 23d, 25th, 27th.

*Upper lake region.*—1st, 3d, 11th, 16th, 17th, 18th, 25th, 26th, 29th, 31st.

*Upper Mississippi valley.*—3d, 5th, 11th, 15th, 17th, 21st, 30th.

*Missouri valley.*—6th, 14th, 17th, 19th, 24th, 28th, 30th.

*Middle slope.*—2d, 4th, 7th, 13th to 18th, 21st, 23d.

*Southern plateau.*—10th, 30th.

*Middle plateau.*—10th, 13th, 28th.

*Northern plateau.*—2d, 4th, 13th, 15th.

*North Pacific coast region.*—2d, 7th, 11th, 12th, 28th, 29th, 30th.

*Middle Pacific coast region.*—1st to 5th, 9th, 11th, 12th, 14th to 17th, 24th, 28th.

*South Pacific coast region.*—3d, 9th, 16th, 21st.

Captain R. B. Quick, commanding the s. s. "Lone Star," reported: "16th, noon, off Alligator Light-house, (N. 24° 50', W. 80° 30'), observed very brilliant solar halo; the circle was about 20° in diameter and was more perfect and brighter than any rainbow."

##### LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

*New England.*—1st, 4th 5th, 6th, 8th, 10th.

*Middle Atlantic states.*—1st to 5th.

*South Atlantic states.*—2d, 3d, 4th, 6th, 7th, 8th, 28th, 31st.

*Eastern Gulf states.*—1st, 4th, 5th, 7th, 29th.

*Western Gulf states.*—4th, 6th, 8th to 11th, 15th, 20th, 30th, 31st.